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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/041,682	01/07/2002	Steven M. Blair	IPG1 (12706.000009)	2960

23506 7590 06/29/2006

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EXAMINER	
CURS, NATHAN M	
ART UNIT	**PAPER NUMBER**
2613	

DATE MAILED: 06/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 10/041,682	Applicant(s) BLAIR ET AL.
	Examiner Nathan Curs	Art Unit 2613

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 April 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-49* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-32,34-42 and 44-49* is/are rejected.

7)☒ Claim(s) *33 and 43* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 38 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Regarding claim 38, the applicant discloses heterodyne reception where active path length stabilization may not needed (specification page 18, lines 7-14), but does not disclose heterodyne reception where active path length stabilization is used on one of the paths of the interferometer.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claim 38 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 38, the phrase "being useable" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1, 9, 16, 18, and 20-23 are rejected under 35 U.S.C. 102(e) as being anticipated by Hung (US Patent Application Publication No. 2004/0008989).

Regarding claim 1, Hung discloses a method of communicating a plurality of signals that have been coherently multiplexed together over an optical link from a first site, the method comprising the steps of: operating a light source unit to produce multiple mutually coherent outputs which are directed as optical signals into a plurality of optical paths comprising "N" signal paths and a reference path (fig. 7 and paragraph 0050) wherein each of the "N" signal paths form one of "N" signal arms of "N" interferometers and has a different path length than the other of the “N” signal paths, the reference path forms the reference path arm for each interferometer, and the path length difference of each interferometer is delta.L.sub.i (fig. 7, element 700 and elements D1-D4 and R); receiving optical signals on each of the “N” signal paths at a modulator therein and modulating the received optical signals with data (fig. 7, element 705 and paragraph 0050); and, combining the optical signals from each of the "N" signal paths and from the reference path to generate a combined optical signal that is transmitted on a single optical path, wherein each optical signal of the combined optical signal is respectively multiplexed in time relative to the other optical signals of the combined optical signal due at least in part to the propagation time delays caused by the path length differences of the signal arms of the interferometers (fig. 7, element 707 and paragraph 0050), and wherein

each optical signal of the combined optical signal has the same phase as the other signals of the combined optical signal (fig. 7, element 1101, equal spacing of D4-D1 and R).

Regarding claim 9, Hung discloses the method of Claim 1, wherein the light source unit produces a singular output that is imaged into multiple optical fibers by use of wavefront splitting (fig. 7, element 701 and subsequent splitter).

Regarding claim 16, Hung discloses the method of Claim 1, wherein the path length differences of each of the "N" interferometers is proportional to the coherence length of the light source used to generate the optical signal on each of the "N" signal paths and the normalized separation relative to the optical path length between the optical signal path of the first interferometer and the reference path (fig. 7, element 1101, equal spacing of D4-D1 and R and paragraph 0049).

Regarding claim 18, Hung discloses the method of Claim 1, wherein the modulator uses phase modulation (paragraph 0050).

Regarding claim 20, Hung discloses a method of communication a plurality of optical signals over an optical link from a first site, the method comprising the steps of: generating a first plurality of optical signals modulated with data, wherein each optical signal of the first plurality of optical signals has a same first wavelength and same phase; delaying optical signals of the first plurality of optical signals in time relative to the other optical signals of the first plurality of optical signals: receiving each optical signal of the first plurality of optical signals at a first combiner at a different time relative to the other optical signals of the first plurality of optical signals: combining the optical signals of the first plurality of optical signals at the first combiner to produce a first coherence multiplexed optical signal including optical signals of the first plurality of optical signals offset in time relative to the other optical signals of the first plurality of optical signals; generating a second plurality of optical signals modulated with data, wherein

each optical signal of the second plurality of optical signals has a same second wavelength and same phase, and wherein the second wavelength is different than the first wavelength of the optical signals of the first plurality of optical signals; delaying optical signals of the second plurality of optical signals in time relative to the other optical signals of the second plurality of optical signals; receiving each optical signal of the second plurality of optical signals at a second combiner at a different time relative to the other optical signals of the second plurality of optical signals: combining the optical signals of the second plurality of optical signals at the second combiner to produce a second coherence multiplexed optical signal including optical signals of the second plurality of optical signals offset in time relative to the other optical signals of the second plurality of optical signals: multiplexing at the first site the first coherence multiplexed optical signals and the second coherence multiplexed optical signal to produce a single wavelength division multiplexed optical signal, and optically transmitting the wavelength division multiplexed optical signal to a second site (fig. 7 and paragraph 0050 and fig. 10 and paragraphs 0047 and 0054).

Regarding claim 21, Hung discloses the method of Claim 20, wherein the wavelength division multiplexed optical signal comprises a dense wavelength division multiplexed optical signal (fig. 10 and paragraphs 0005, 0006 and 0054).

Regarding claim 22, Hung discloses the method of Claim 20, further comprising the steps of receiving at a second site the wavelength division multiplexed optical signal and demultiplexing at the second site the received wavelength division multiplexed signal into the first coherence multiplexed signal and the second coherence multiplexed optical signal, and directing at least one of the first coherence multiplexed optical signal and the second coherence multiplexed optical signal to a coherence demultiplexing unit (fig. 10 and paragraph 0054).

Regarding claim 23, Hung discloses the method of Claim 22, wherein the step of demultiplexing includes dense wavelength division demultiplexing (fig. 10 and paragraphs 0005, 0006 and 0054).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 2, 13, 14, 29-31, 34, 35, 44 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (US Patent Application Publication No. 2004/0008989).

Regarding claim 2, Hung discloses the method of Claim 1, further comprising the steps of optically splitting the combined optical signal into "N" optical signals on "N" path pairs at a second site, and coherently demultiplexing each of the "N" optical signals to retrieve the data through differential detection (fig. 7, elements 709, 711 and "phase delay reversal" and paragraph 0050). Hung discloses performing a phase delay reversal at the receive end, where each path pair receives the reference signal (fig. 7, element 709 and paragraph 0050), but does not explicitly show that each "N" path pair a forms an interferometer with two inputs and two outputs with the path length difference of each interferometer being delta.L.sub.i.prime. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to use an interferometer for each receive end path pair shown by Hung, with each path pair interferometer reflecting the inverse of the corresponding phase delay interferometer

structure of the transmitter, in order to reverse the delay in each receive end path pair as disclosed by Hung.

Regarding claim 13, Hung discloses the method of Claim 1, wherein the light source unit comprises a single source that feeds a splitter, where one output of the splitter feeds a common reference path (r) for "N" interferometers and the other output of the coupler feeds "N" signal paths comprising the second arms of the "N" interferometers (fig. 7, element 703). Hung does not disclose the single source feeding a 1x2 coupler, with one output of the coupler feeding a common reference path (r) for "N" interferometers and the other output of the coupler feeds a 1xN splitter; however, it would have been obvious to one of ordinary skill in the art at the time of the invention that the reference path could be formed by a 1x2 coupler and then the N paths formed by a 1xN splitter, as passive optical coupling using couplers and splitters is very well known in the art and there is no functional difference between using one coupler for splitting followed by a splitter versus simply using one splitter.

Regarding claim 14, Hung discloses the method of Claim 13, wherein "N" is greater than or equal to 3 (fig. 7, element 703).

Regarding claim 29, Hung discloses a method of receiving a plurality of optical signals that have been coherently multiplexed together and transmitted over an optical link from a first site to a second site, the method comprising the steps of receiving an optical signal including a first coherently multiplexed optical signal and second coherently multiplexed optical signal, wherein the first coherently multiplexed optical signal includes a first optical signal offset in time relative to a second optical signal and having the same phase as the second optical signal, and wherein the second coherently multiplexed optical signal includes a third optical signal offset in time relative to a fourth optical signal and having the same phase as the fourth optical signal (fig. 7, and paragraph 0050); wavelength division demultiplexing the received optical signal into

the first coherently multiplexed optical signal and the second coherently multiplexed optical signal (fig. 10 and paragraph 0054); optically splitting the first coherently multiplexed optical signal into optical signals on path pairs and coherently demultiplexing the first coherently multiplexed optical signals in to the first and second optical signals (fig. 7, element 709 and paragraph 0050). Hung does not explicitly disclose the interferometers of the receive end as first and second path pairs forming an interferometer with an optical signal path and a reference path with the path length difference of being delta.L.sub.i; however, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the reverse of the interferometer structure of the transmitter at the receive end as described above for claim 2.

Regarding claim 30, Hung discloses the method of Claim 29, wherein the step of coherently demultiplexing is performed using a coherence demultiplexer at the second site matched to a coherence multiplexer so that |delta.L.sub.i – delta.L.sub.i'| < L.sub.coh (fig. 7, element 709 and paragraphs 0049 and 0050).

Regarding claim 31, Hung discloses the method of Claim 30, wherein optical signals on the optical signal paths of the first and second path pairs are separated in path length from each other by a distance of at least the numerical product of the coherence length of the light source used to generate the optical signals and the normalized separation relative to the optical path length between the optical signal path of the first path pair and the reference path (fig. 7, element 1101, equal spacing of D4-D1 and R and paragraph 0049, applicable to both the transmit end and receive end after the result of the receive end path pairs obviousness describe above for claim 29).

Regarding claim 34, Hung discloses the method of Claim 29, wherein the step of coherently demultiplexing is performed using a coherence demultiplexer having a coherence

receiver (fig. 7 and paragraph 0050), and an active polarization adjuster with feedback communicates with the coherence receiver (fig. 15, element 1503 and paragraph 0063).

Regarding claim 35, Hung discloses the method of Claim 29, wherein the step of coherently demultiplexing is performed using a coherence demultiplexer having an interferometer (fig. 7 and paragraph 0050), with an active polarization adjuster with feedback in one path of the interferometer (fig. 15, element 1503 and paragraph 0063, where element 1503, feedback controlled via the microcontroller, is in a path of the interferometer).

9. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (US Patent Application Publication No. 2004/0008989) in view of Gluckstad (US Patent No. 6011874).

Regarding claim 3, Hung discloses the method of Claim 1, but does not discloses that the light source unit comprises a phase locked laser diode array. Gluckstad discloses that a phase locked laser diode array is one of several means for achieving coherent light radiation (col. 5, lines 16-22). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a phase locked laser diode array to achieve coherent light radiation for the light source unit of Hung, since Gluckstad discloses this as conventional.

10. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (US Patent Application Publication No. 2004/0008989) in view of Gluckstad (US Patent No. 6011874) as applied to claim 3 above, and further in view of Leger et al. ("Leger") (US Patent No. 5027359).

Regarding claims 4, 5 and 6, the combination of Hung and Gluckstad discloses the method of Claim 3, but does not disclose that the light source unit includes an imaging system comprising a microlens array and cylindrical lens. However, Leger discloses a phase locked

laser diode array for producing coherent laser light, including an imaging system comprising a microlens array and cylindrical lens (fig. 3 and col. 1, lines 10-28 and col. 6, lines 26-61). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the phase locked laser diode array of Leger in the combination of Hung and Gluckstad, to achieve coherent light radiation capable of achieving high power and high brightness, as taught by Leger.

11. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (US Patent Application Publication No. 2004/0008989) in view of Gluckstad (US Patent No. 6011874), and further in view of Barlow (US Patent No. 4401363).

Regarding claim 7, Hung discloses the method of Claim 1, but does not disclose that the light source unit comprises a phase locked light emitting diode array. Gluckstad discloses that a phase locked laser diode array is one of several means for achieving coherent light radiation (col. 5, lines 16-22). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a phase locked laser diode array to achieve coherent light radiation for the light source unit of Hung, since Gluckstad discloses this as conventional. Further, Barlow discloses that either a laser diode or an LED can produce a coherent light output (col. 2, line 67 to col. 3, line 8). It would have been obvious to one of ordinary skill in the art at the time of the invention that either laser diodes or LEDs could be used for the light radiation means of the phase locked diode array of the combination of Hung and Gluckstad, since the coherent LED and coherent laser are essentially interchangeable as taught by Barlow.

12. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (US Patent Application Publication No. 2004/0008989) in view of Gluckstad (US Patent No. 6011874), and

further in view of Barlow (US Patent No. 4401363) as applied to claim 7 above, and further in view of Leger (US Patent No. 5027359).

Regarding claim 8, the combination of Hung and Gluckstad discloses the method of Claim 7, but does not disclose that the light source unit includes an imaging system. However, Leger discloses a phase locked laser diode array for producing coherent laser light, including an imaging system comprising a microlens array and cylindrical lens (fig. 3 and col. 1, lines 10-28 and col. 6, lines 26-61). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the phase locked laser diode array teaching of Leger to the phase locked LED array in the combination of Hung and Gluckstad, to achieve coherent light radiation capable of achieving high power and high brightness, as taught by Leger.

13. Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (US Patent Application Publication No. 2004/0008989) in view of Leger (US Patent No. 5027359).

Regarding claims 10, 11 and 12, Hung discloses the method of Claim 1, wherein the light source unit produces a singular output which is transmitted into multiple integrated optical waveguide channels (fig. 7, element 701 and subsequent splitter), but does not disclose that the light source output is imaged by an imaging system comprising a microlens array and cylindrical lens. However, Leger discloses a phase locked laser diode array for producing coherent laser light, including an imaging system comprising a microlens array and cylindrical lens (fig. 3 and col. 1, lines 10-28 and col. 6, lines 26-61). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the phase locked laser diode array of Leger in Hung to achieve coherent light radiation capable of achieving high power and high brightness, as taught by Leger.

14. Claims 17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (US Patent Application Publication No. 2004/0008989) in view of Kartalopoulos ("Introduction to DWDM Technology", IEEE Press, 2000; pages 161-167).

Regarding claims 17 and 19, Hung discloses the method of Claim 1, where the system is a coherence multiplexing system and wherein the modulator uses phase modulation, but does not disclose that the modulator uses amplitude or frequency modulation. Kartalopoulos discloses PSK, FSK and ASK optical modulation for optical coherence transmission using in-line modulation techniques (page 161 and pages 165-167, sections ASK, PSK and FSK). It would have been obvious to one of ordinary skill in the art at the time of the invention that the phase modulation for the data modulation of Hung could be substituted with amplitude or frequency modulation, since all three modulation techniques are conventional for optical data modulation and each have their own advantages and disadvantages, as taught by Kartalopoulos.

15. Claims 15, 36 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (US Patent Application Publication No. 2004/0008989) in view of Kartalopoulos ("Introduction to DWDM Technology", IEEE Press, 2000; pages 161-167), and further in view of Kowalski (US Patent Application Publication No. 2001/0048538).

Regarding claim 15, Hung discloses the method of Claim 1, wherein an optical signal directed into the reference path has a reference frequency (fig. 7, element 704) and discloses the system as a coherence multiplexing system, but does not disclose that a frequency modulator is placed in the reference path to shift the reference frequency. Kartalopoulos discloses that optical heterodyne or homodyne detection techniques are used for coherent optical transmission systems (page 161, second paragraph). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use optical heterodyne or

homodyne detection techniques at the receivers in the coherence multiplexing system of Hung, since this is conventional for optical coherence transmission, as taught by Kartalopoulos. In addition, Kowalkski discloses an interferometer-based transmitter, where a frequency shifter is used in one branch in order to achieve heterodyne signal detection (paragraphs 0049 and 0059). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a frequency shifter on the reference signal arm of the Hung coherence multiplexer, to achieve heterodyne signal detection for each coherence signal, since heterodyne signal detection is conventional for optical coherence transmission.

Regarding claim 36, Hung discloses the method of Claim 29, wherein the step of coherently demultiplexing is performed using a coherence demultiplexer having an interferometer, as described above for claim 29, but does not disclose that a frequency modulator is placed in one path of the interferometer. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Kartalopoulos and Kowalski with Hung as described above for claim 15.

Regarding claim 37, Hung discloses the method of Claim 29, but does not disclose that the step of coherently demultiplexing is performed using a coherence demultiplexer employing heterodyne reception. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Kartalopoulos and Kowalski with Hung as described above for claim 15.

16. Claims 24-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (US Patent Application Publication No. 2004/0008989) in view of Islam et al. ("Islam") (US Patent Application Publication No. 2002/0131693).

Regarding claim 24, Hung discloses the method of Claim 20, but does not disclose the step of spectrally slicing the output of a broadband light source into a first output having the first wavelength and a second output having the second wavelength, wherein the first and second wavelength comprise different wavelengths. Islam discloses generated source wavelengths for a WDM system by spectrally slicing a broadband light source (paragraph 0005). It would have been obvious to one of ordinary skill in the art at the time of the invention to generated source wavelengths for the WDM wavelengths of Hung by spectrally slicing a broadband light source, in order to avoid the high cost of wavelength stabilization for individual wavelength lasers, as taught by Islam (paragraph 0004).

Regarding claim 25, the combination of Hung and Islam discloses the method of Claim 24, wherein the broadband light source comprises a mode locked laser source (Islam: paragraph 0005).

Regarding claim 26, the combination of Hung and Islam discloses the method of Claim 24, wherein the broadband light source comprises a fiber amplifier (Islam: paragraph 0005).

Regarding claim 27, the combination of Hung and Islam discloses the method of Claim 24, wherein the broadband light source comprises an amplified spontaneous emission source (Islam: paragraph 0005).

Regarding claim 28, the combination of Hung and Islam discloses the method of Claim 24, wherein the step of spectrally slicing comprises wavelength division demultiplexing (Islam: paragraph 0005, where spectral slicing is the same as wavelength demultiplexing the broadband spectrum).

17. Claims 32, 39-42, 44, 45 and 47-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (US Patent Application Publication No. 2004/0008989) in view of

Kartalopoulos ("Introduction to DWDM Technology", IEEE Press, 2000; pages 161-167), and further in view of Mahon et al. ("Mahon") (US Patent No. 5477369).

Regarding claim 32, Hung discloses the method of Claim 29, but does not disclose that the step of coherently demultiplexing employs homodyne reception and active path length stabilization. Kartalopoulos discloses that optical heterodyne or homodyne detection techniques are used for coherent optical transmission systems (page 161, second paragraph). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use optical heterodyne or homodyne detection techniques at the receivers in the coherence multiplexing system of Hung, since this is conventional for optical coherence transmission, as taught by Kartalopoulos. Further, Mahon discloses a homodyne receiver for optical signal, where the path lengths of the receiver are adapted in conformity with a selected fixed phase difference (col. 2, line 42 to col. 3, line 3). It would have been obvious to one of ordinary skill in the art at the time of the invention to use active path length stabilization for homodyne detection, based on the homodyne detection teaching of Mahon, in order to maximize amplitude of the signal beams for detection, as taught by Mahon.

Regarding claim 39, Hung discloses a method of communicating a plurality of optical signals over an optical link from a first site to a second site, the method comprising the steps of optically multiplexing a plurality of output optical signals to form a multiplexed optical signal at a first site (fig. 10 and paragraph 0054), wherein each output optical signal of the plurality of output optical signals includes a coherently multiplexed plurality of modulated optical signals that are offset in time relative to one another, and wherein each of the modulated optical signals has the same wavelength and the same phase (fig. 7 and paragraph 0050); communicating the multiplexed signal; optically demultiplexing the multiplexed signal at a second site into a plurality of optically demultiplexed signals (fig. 10 and paragraph 0054); delivering the plurality of

optically demultiplexed signals to at least one coherence demultiplexer (fig. 7, element 709 and paragraphs 0047 and 0050). Hung does not explicitly disclose the interferometers of the receive end as each having a path pair, where a single path pair forms an interferometer with two arms having different path lengths, wherein the two arms include a signal path carrying a data signal and a reference path carrying a reference signal; recombining the data signal and the reference signal to produce a recombined signal. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the reverse of the interferometer structure of the transmitter at the receive end as described above for claim 2. Hung does not disclose communicating the recombined signal to a coherence receiver having two light source detectors connected to a differential amplifier. Kartalopoulos discloses that optical heterodyne or homodyne detection techniques are used for coherent optical transmission systems (page 161, second paragraph). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use optical heterodyne or homodyne detection techniques at the receivers in the coherence multiplexing system of Hung, since this is conventional for optical coherence transmission, as taught by Kartalopoulos. Further, Mahon discloses a coherence receiver having two light source detectors connected to a differential amplifier (fig. 1 and col. 3, line 60 to col. 4, line 44). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the coherence receiver of Mahon for receiving the optical signals demultiplexed in Hung, since such detection for coherence signals is conventional in optical systems.

Regarding claim 40, the combination of Hung, Kartalopoulos and Mahon discloses the method of Claim 39, wherein the at least one coherence demultiplexer is matched to a coherence multiplexer that produces the output optical signals of the plurality of output optical

signal (Hung: paragraph 0049, where "matched" coherence means |delta.L.sub.i – delta.L.sub.i.prime| < L.sub.coh).

Regarding claim 41, the combination of Hung, Kartalopoulos and Mahon discloses the method of Claim 40, wherein the optical signals on the signal path and the reference path are separated in path length from each other by a distance of at least the numerical product of the coherence length of the light source used to generate the optical signals and the normalized separation relative to the path length between the signal path of a first path pair and the reference path (Hung: fig. 7, element 1101, equal spacing of D4-D1 and R and paragraph 0049, applicable to both the transmit end and receive end after the result of the receive end path pairs obviousness describe above for claim 39).

Regarding claim 42, the combination of Hung, Kartalopoulos and Mahon discloses the method of Claim 39, wherein the at least one coherence demultiplexer includes a coherence receiver using homodyne reception and active path length stabilization (Mohan: col. 2, line 42 to col. 3, line 3).

Regarding claim 44, the combination of Hung, Kartalopoulos and Mahon discloses the method of Claim 39, further comprising a step of adjusting the polarity of the reference signal with an active polarization adjuster using feedback (Hung: fig. 15, element 1503 and paragraph 0063).

Regarding claim 45, the combination of Hung, Kartalopoulos and Mahon discloses the method of Claim 39, wherein an active polarization adjuster with feedback exists in one path of each interferometer (Hung: fig. 15, element 1503 and paragraph 0063).

Regarding claim 47, the combination of Hung, Kartalopoulos and Mahon discloses the method of Claim 39, wherein the coherence receiver uses heterodyne reception, as described above for claim 39.

Regarding claim 48, the combination of Hung, Kartalopoulos and Mahon discloses the method of Claim 47, wherein active path length stabilization is used in one of the paths of the interferometer (Mohan: col. 2, line 42 to col. 3, line 3).

Regarding claim 49, the combination of Hung, Kartalopoulos and Mahon discloses the method of Claim 39, further comprising a step of dropping a plurality of coherence multiplexed signals (Hung: fig. 26 and paragraph 0078).

18. Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hung (US Patent Application Publication No. 2004/0008989) in view of Kartalopoulos ("Introduction to DWDM Technology", IEEE Press, 2000; pages 161-167), and further in view of Mahon et al. ("Mahon") (US Patent No. 5477369) as applied to claims 32, 39-42, 44, 45 and 47-49 above, and further in view of Kowalski (US Patent Application Publication No. 2001/0048538).

Regarding claim 46, the combination of Hung, Kartalopoulos and Mahon discloses the method of Claim 39, but does not disclose that a frequency modulator is present in one path of each interferometer. Kowalkski discloses an interferometer-based transmitter, where a frequency shifter is used in one branch in order to achieve heterodyne signal detection (paragraphs 0049 and 0059). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a frequency shifter on the reference signal arm of the Hung coherence multiplexer, to achieve heterodyne signal detection for each coherence signal, since heterodyne signal detection is conventional for optical coherence transmission.

Allowable Subject Matter

19. Claims 33 and 43 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

20. Applicant's arguments filed 13 April 2006 have been fully considered but they are not persuasive.

The applicant argues that the specification does not assert that active path length stabilization cannot be used for heterodyne detection on page 18, lines 12-13. However, the specification does not assert that active path length stabilization can be used for heterodyne detection. Not asserting that it cannot be used is not equivalent to asserting that it can be used.

The applicant also argues that Hung discloses phase multiplexing as opposed to the applicant disclosing time delay and time multiplexing. However, the interferometer of Hung fig. 7, element 700, clearly achieves time delay and time multiplexing by way of the different arm path lengths, and also evidence by the time spacing of D4-D1 and R shown for element 1101. Whether or not the applicant's invention suffers from the "modulo 2π problem" is irrelevant if Hung reads on the applicant's claim language.

The applicant argues that Hung splitting is not the applicant's "wavefront splitting" because Hung "appears to disclose amplitude splitting". However, Hung's splitting reads on the applicant's claimed "wavefront splitting", because "wavefront" only limits the splitting to splitting a signal having some kind of waveform, and Hung signals inherently have waveforms.

The applicant argues paragraph 0054 of Hung doesn't discloses DWDM, but Hung discloses DWDM for the invention in paragraphs 0005 and 0006.

The applicant argues that the 1xN and Nx1 switch of Hung are "with all due respect, entirely different" than the 1xN and Nx1 splittler/coupler employed by applicant. However, this is vague assertion and not a persuasive argument against Hung reading on the claim language.

The applicant argues against Gluckstad and Leger as having "nothing to do with" optical fiber-based communication systems or methods. However, Gluckstad and Leger do not have to address optical fiber-based communications systems or methods. Gluckstad and Leger are reasonably pertinent to a particular problem with which Hung and the applicant were both concerned, namely, coherent light radiation (see MPEP 2141.01(a) [R-3]).

The applicant argues against Kartalopoulous by asserting that ASK or PSK modulation and heterodyne detection can't be used with Hung, but this argument is not persuasive because the applicant gives no reason why ASK or PSK modulation and heterodyne detection can't be used with Hung.

The applicant argues against Mahon as requiring a selected phase difference for homodyne reception. However, Mahon requiring or not a selected phase difference for homodyne reception is irrelevant if the combination reads on the applicant's claim language. The motivation to combine Mahon as described in rejections above is proper, and is not shown to be improper by the applicant arguing that the applicant's invention is "more flexible" than Mahon.

21. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Conclusion

22. Any inquiry concerning this communication from the examiner should be directed to N. Curs whose telephone number is (571) 272-3028. The examiner can normally be reached on M-F (from 9 AM to 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan, can be reached at (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (800) 786-9199.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pairdirect.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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